

Complete Larval Development of a Sand Bubbler Crab, *Scopimera longidactyla* (Brachyura, Ocypodidae), Reared in the Laboratory

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실험실에서 사육된 발콩게 *Scopimera longidactyla* (달랑게과)의 유생발생

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적 요

실험실에서 사육한 발콩게의 유생기를 자세히 기술, 도시하였다. 본 종은 5 zoea와 1 megalopa 유생기를 가지며, 수온 25°C에서 megalopa와 제1기 crab은 부화후 각각 21일과 31일 만에 나타났다.

엽낭계속의 유생은 갑각에 대한 이마가시 길이의 상대비에 의하여 콩게아과의 타 속과 달랑게아과의 타 아과의 유생들로부터 구별될 수 있다. 발콩게의 유생은 엽낭계의 유생과 형태적으로 매우 유사하나 유생의 크기와 부속지의 강모식의 차이에 의해 구별될 수 있다.

Key words: Brachyura, *Scopimera longidactyla*, larval development.

INTRODUCTION

The sand bubbler crab, *Scopimera longidactyla* Shen, 1932, occurs in the Korea Strait and the Yellow Sea of Korea, the Santung Peninsula and the Peichihli Bay of North China and Taiwan, and is found in the beaches of sand or muddy sand around the estuaries or inland sea (Shen, 1932; Kim, 1973; Kim and Kim, 1982).

For the genus *Scopimera*, the larval descriptions are known for *S. globosa* De Haan, *S. inflata* H. Milne Edwards and *S. crabricauda* Alcock. Aikawa (1929) and Gamô (1958) described the first stage zoea and the megalopa of *S. globosa* respectively, but the complete larval development of this species was described

by Terada (1976). The complete larval stages of *S. inflata* were described by Fielder and Greenwood (1985) and the first stage zoeal description of *S. crabricauda* was provided by Rice (1976).

The larval development of *S. longidactyla* is of particular interest, when compared to that of *S. globosa*, in that these two species are very similar in adult morphology to each other and sympatric in the Yellow Sea. In this paper, the complete larval stages of *S. longidactyla* are described in detail and compared to those of other known ocyropodid larvae, especially those of *S. globosa*.

MATERIALS AND METHODS

Ovigerous females of *Scopimera longidactyla* were collected from the sandy beach at the Yöngjong Island in the Yellow Sea, Korea on 22 July 1987, and maintained in a seawater aquarium provided with beach sand for a shelter, until hatching occurred.

Newly hatched zoeae were removed into glass bowls containing 80 ml filtered seawater of 33.3‰ salinity and held in a culture chamber with a light regime of 14 hours light: 10 hours darkness and 25°C temperature. Five larvae were put in individual bowl and a total of 175 first stage zoeae were cultured, besides the mass culture. The larvae were fed freshly hatched *Artemia* nauplii, and seawater and food were changed daily. Samples of living larvae, plus all exuviae and dead larvae, were preserved in 7% neutral formalin. At least ten specimens were measured and dissected for each larval stage. Drawings and measurements were made with a camera lucida and an ocular micrometer.

The terminology of setal types follows that used by Bookhout and Costlow (1974) and Pohle and Telford (1981). Direction of setal formulae in the descriptions progresses proximal to distal.

RESULTS

Larval development of *Scopimera longidactyla* under the laboratory conditions consists of 5 zoeal stages followed by the megalopa. The megalopal and first crab stages were attained in 21 and 31 days after hatching respectively. Measurements of various features of the larvae are given in Table 1. Morphological features of each larval stage are as follows.

First Zoea (Fig. 1)

Carapace (Fig. 1-A,A'). Smooth and globose with well-developed rostral, dorsal and lateral spines; rostral and dorsal spines very long and tapered; lateral spines shorter, slightly curved downward; small denticles present on all spines. Eyes sessile. Pair of simple setae flanking base of dorsal spine. Postero-ventral carapace margin round and naked.

Abdomen (Fig. 1-B). Five somites and telson; somite 1 with medio-dorsal simple seta, concealed by carapace, and terminating in round postero-lateral knob; somites 2-5 each with paired simple setae dorsally and terminating in postero-lateral spines; somites 2 and 3 with distinct lateral knobs.

Telson (Fig. 1-B). Bifurcated; surface covered with clusters of denticulettes; furcal shaft long and slender, with dorsal spine; six plumodenticulate setae on inner margin.

Antennule (Fig. 1-C). Smooth and conical; with 2 long aesthetascs and simple seta.

Antenna (Fig. 1-D). Long and slender; two rows of denticles of distal half of protopodal process.

Table 1. Measurements of various features of the zoeae and megalopa of *Scopimera longidactyla*. All measurements are in mm; mean values, for ten specimens of each larval stage, are given with standard deviations in brackets.

Feature	Zoea I	Zoea II	Zoea III	Zoea IV	Zoea V
TSL	1.70(0.07)	2.34(0.14)	3.53(0.20)	4.86(0.08)	6.22(0.12)
Range	1.58-1.83	2.10-2.50	3.28-3.68	4.80-4.95	6.13-6.35
CL(A)	0.43(0.02)	0.52(0.03)	0.72(0.03)	0.97(0.06)	1.26(0.02)
Range	0.40-0.48	0.48-0.55	0.70-0.77	0.88-1.02	1.25-1.28
DL(B)	0.59(0.04)	0.82(0.05)	1.22(0.15)	1.69(0.08)	2.19(0.05)
Range	0.53-0.65	0.73-0.90	1.00-1.38	1.63-1.78	2.15-2.25
RL(C)	0.77(0.03)	1.08(0.08)	1.64(0.08)	2.20(0.08)	2.86(0.11)
Range	0.73-0.83	0.95-1.20	1.50-1.70	2.08-2.30	2.70-3.00
AL(D)	0.36(0.03)	0.47(0.05)	0.64(0.03)	0.81(0.01)	0.99(0.06)
Range	0.33-0.40	0.43-0.58	0.60-0.68	0.80-0.83	0.93-1.05
Ratio B/A	1.37	1.58	1.69	1.74	1.74
Ratio C/A	1.79	2.08	2.28	2.27	2.27
Ratio B/C	0.77	0.76	0.74	0.77	0.77
Ratio D/C	0.47	0.44	0.39	0.37	0.35
Megalopa					
CL(E)	1.23(0.01)				
Range	1.23-1.25				
CW(F)	1.09(0.06)				
Range	1.01-1.15				
Ratio F/E	0.89				

AL, second antenna length; CL, carapace length; CW, carapace width; DL, dorsal spine length; RL, rostral spine length; TSL, total spine length (=length from rostral to dorsal spine tips).

Exopod absent.

Mandibles (Fig. 1-E). Asymmetrical; molar regions irregularly dentated; two prominent teeth between molar and incisor processes on right mandible.

Maxillule (Fig. 1-F). Coxal endite with 4 plumodenticulate setae; basal endite with 5 plumodenticulate setae and process; two-segmented endopod with 4 terminal plumodenticulate setae on distal segment; microtrichia on dorsal margin.

Maxilla (Fig. 1-G). Coxal endite with 2 terminal and 3 subterminal plumose setae; distal and proximal lobes of basal endite with 4 and 5 plumodenticulate setae respectively; unsegmented endopod slightly bilobed, with 5 plumodenticulate setae terminally; lateral surface of endopod and endites covered with microtrichia;

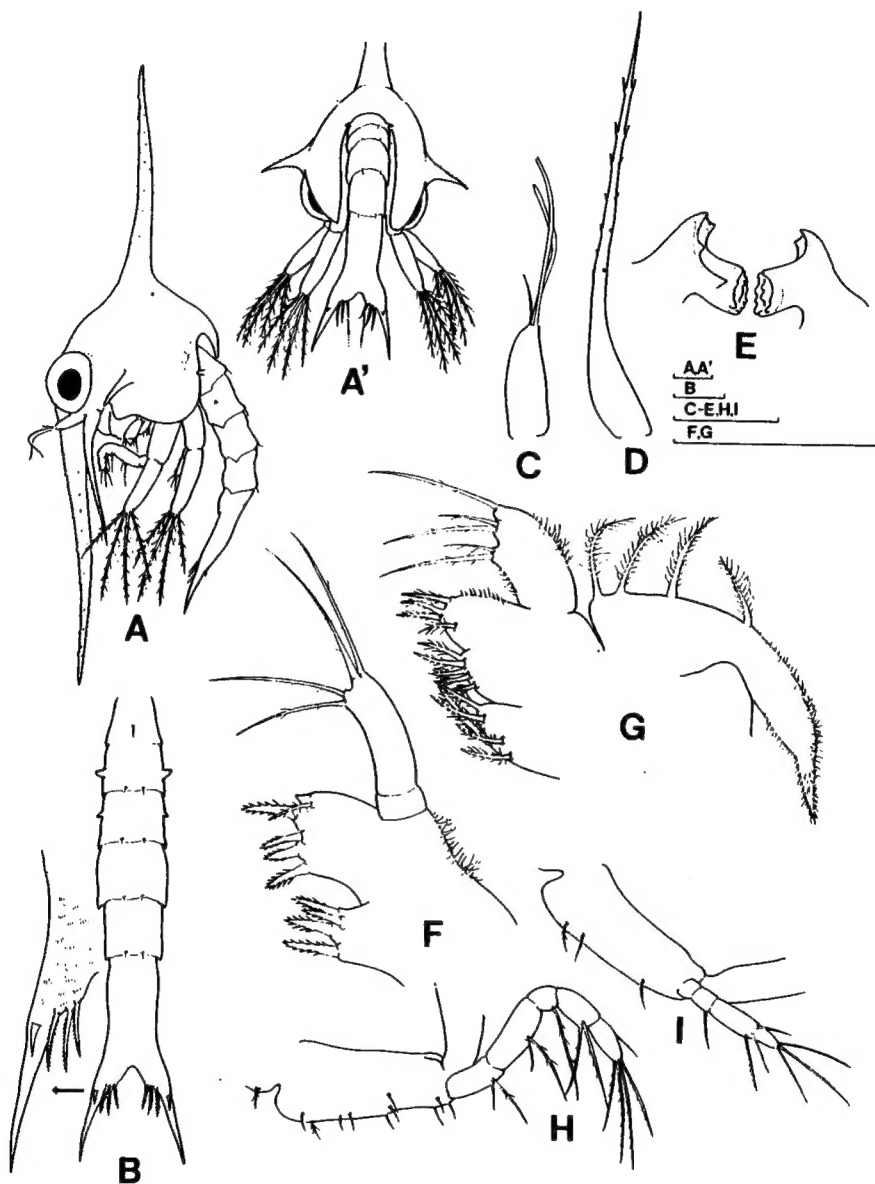


Fig. 1. First zoea of *Scopimera longidactyla*. A, lateral view; A', posterior view; B, dorsal view of abdomen; C, antennule; D, antenna; E, mandibles; F, maxillule; G, maxilla; H, maxilliped 1; I, maxilliped 2. Scale bars = 0.1 mm.

scaphognathite bearing 4 densely plumose setae and terminal process with dense microtrichia.

Maxilliped 1 (Fig. 1-H). Coxa with plumodenticulate seta; basis with a plumodenticulate and 9 simple setae, setation 2, 2, 3, 3; endopod five-segmented, plumodenticulate setation 2, 2, 1, 2, 5 distally (of these, simple seta on segments 1, 2 and 5); exopod with 4 plumose natatory setae.

Maxilliped 2 (Fig. 1-I). Coxa naked; basis with a plumodenticulate and 2 simple setae ventrally; three-segmented endopod with simple seta on middle segment and a plumodenticulate and 5 simple setae on distal segment; exopod with 4 plumose natatory setae.

Chromatophores. The majority of chromatophores are dark brown and present on mandibles and labrum, posterior to eyes, on each ventral side of carapace, on medio-posterior surface of rostral carapace spine and along ventral region of abdominal somites 2-5 and telson. Orange red chromatophores occur through dorsal carapace spine and distal half of rostral carapace spine. This chromatophore pattern is consistent for all zoeal stages.

Second Zoea (Fig. 2)

Carapace (Fig. 2-A). Paired simple setae added on eyestalks and forehead respectively; postero-ventral

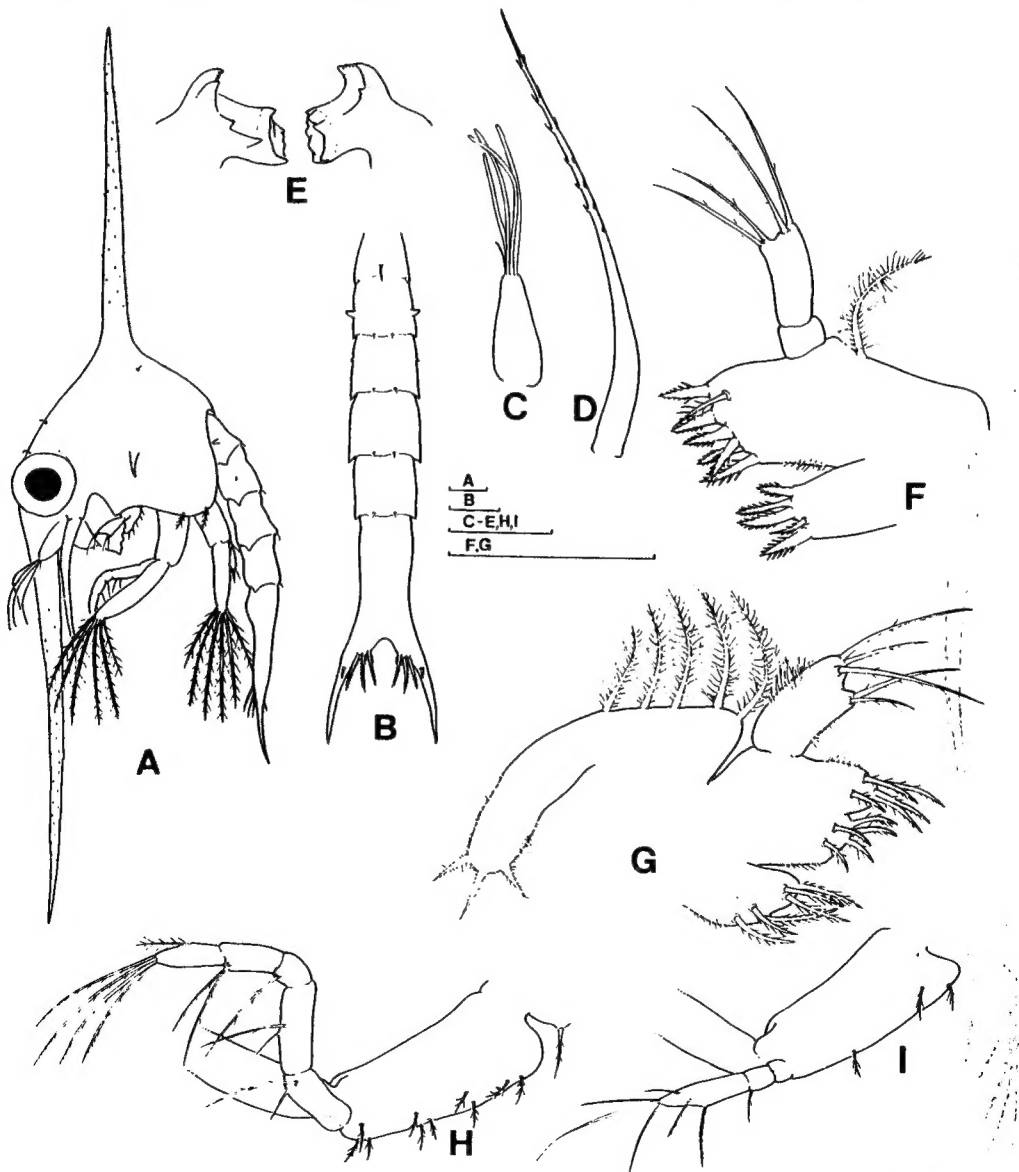


Fig. 2. Second zoea of *Scopimera longidactyla*. A, lateral view; B, dorsal view of abdomen; C, antennule; D, antenna; E, mandibles; F, maxillule; G, maxilla; H, maxilliped 1; I, maxilliped 2. Scale bars = 0.1 mm.

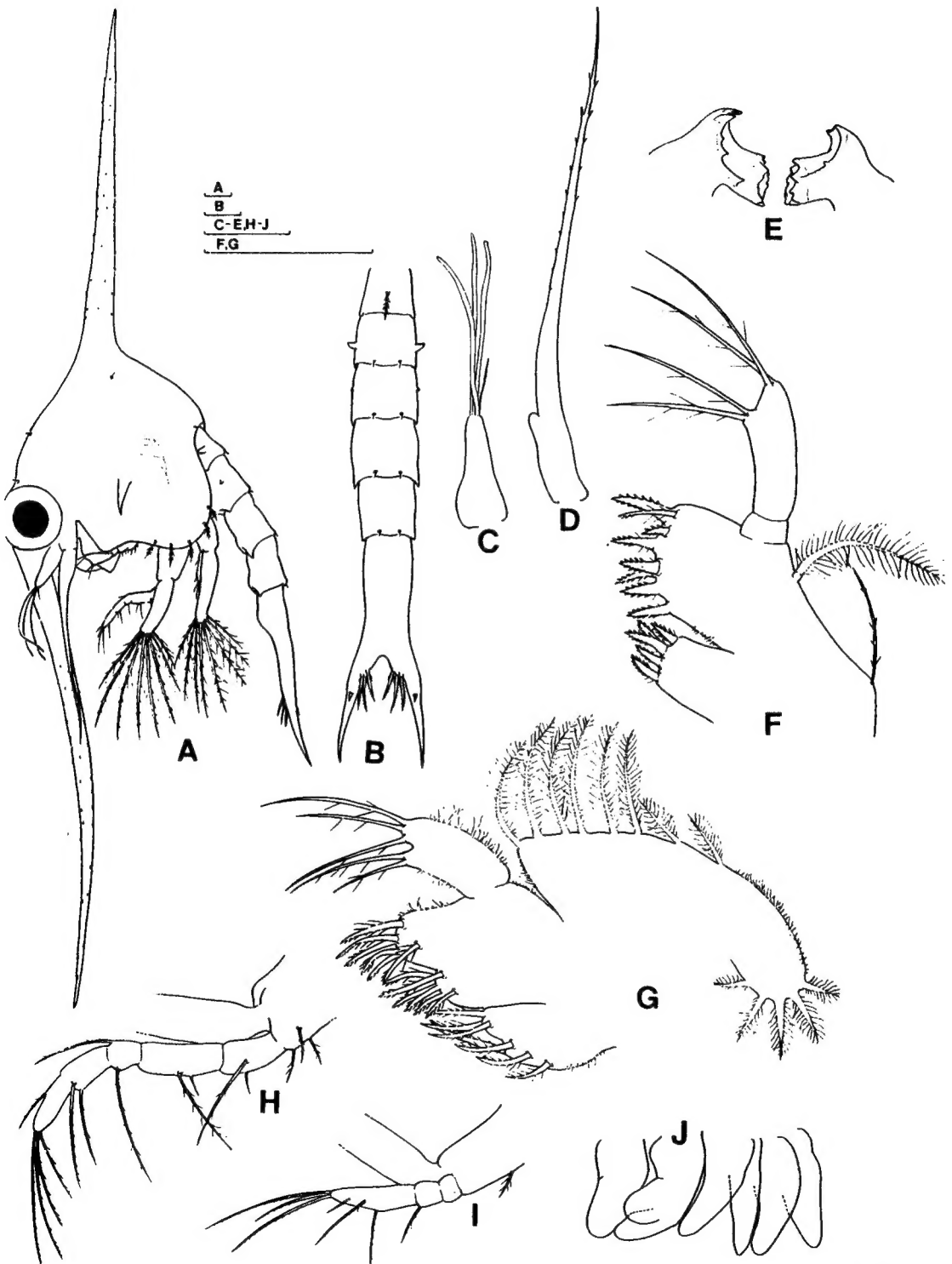


Fig. 3. Third zoea of *Scopimera longidactyla*. A, lateral view; B, dorsal view of abdomen; C, antennule; D, antenna; E, mandibles; F, maxillule; G, maxilla; H, maxilliped 1; I, maxilliped 2; J, maxilliped 3 and pereopods. Scale bars = 0.1 mm.

margin with 2 plumose setae. Eyes movable.

Abdomen (Fig. 2-B). As in the first stage.

Antennule (Fig. 2-C). With 4 aesthetascs and simple seta.

Antenna (Fig. 2-D). As in the first stage.

Mandibles (Fig. 2-E). As in the first stage but additional tooth on left incisor margin.

Maxillule (Fig. 2-F). Coxal and basal endites each with 5 and 7 plumodenticulate setae respectively; densely plumose seta added on dorsal margin.

Maxilla (Fig. 2-G). Coxal endite with additional plumose seta terminally; distal and proximal lobes of basal endite each with 5 plumodenticulate setae; scaphognathite with 8 densely plumose setae.

Maxilliped 1 (Fig. 2-H). Simple setae on basis becoming plumodenticulated; simple seta on distal segment of endopod becoming plumosed; exopod with 6 plumose natatory setae.

Maxilliped 2 (Fig. 2-I). Simple setae on basis becoming plumodenticulated; exopod with 6 plumose natatory setae.

Third Zoea (Fig. 3)

Carapace (Fig. 3-A). Postero-ventral margin with 5 plumose setae.

Abdomen (Fig. 3-B). As in the second stage but somite 1 with medio-dorsal plumose seta.

Antennule (Fig. 3-C). With 3 aesthetascs and simple seta.

Antenna (Fig. 3-D). Endopod present as small bud.

Mandibles (Fig. 3-E). As in the second stage.

Maxillule (Fig. 3-F). Basal endite with 7-8 plumodenticulate setae; long plumodenticulate seta added on proximal margin.

Maxilla (Fig. 3-G). Coxal endite with 3 terminal and 4 subterminal plumose setae; distal and proximal lobes of basal endite each with 6 plumodenticulate setae; scaphognathite with 13-15 densely plumose setae.

Maxilliped 1 (Fig. 3-H). Long plumose seta added on third segment of endopod, now setation 2, 2, 2, 2, 5; exopod with 8 plumose natatory setae.

Maxilliped 2 (Fig. 3-I). Also 2 additional natatory setae on exopod.

Maxilliped 3 and Pereiopods (Fig. 3-J). Present as rudimentary buds.

Fourth Zoea (Fig. 4)

Carapace (Fig. 4-A). Paired simple setae added on base of rostral spine and eyestalks respectively; postero-ventral margin with 8-10 plumose setae.

Abdomen (Fig. 4-B). Somite 6 now present; somite 1 with 2-3 medio-dorsal plumose setae; small, round pleopod buds on somites 2-5.

Antennule (Fig. 4-C). With 3 aesthetascs and simple seta terminally and an aesthetascs subterminally.

Antenna (Fig. 4-D). Endopod bud longer.

Mandibles (Fig. 4-E). As in the third stage.

Maxillule (Fig. 4-F). Coxal endite with 6 plumodenticulate setae; basal endite with 10 terminal and a lateral plumodenticulate setae; additional plumodenticulate seta on proximal margin.

Maxilla (Fig. 4-G). Coxal endite with 3 terminal, 5-6 subterminal and a lateral plumose setae; distal and

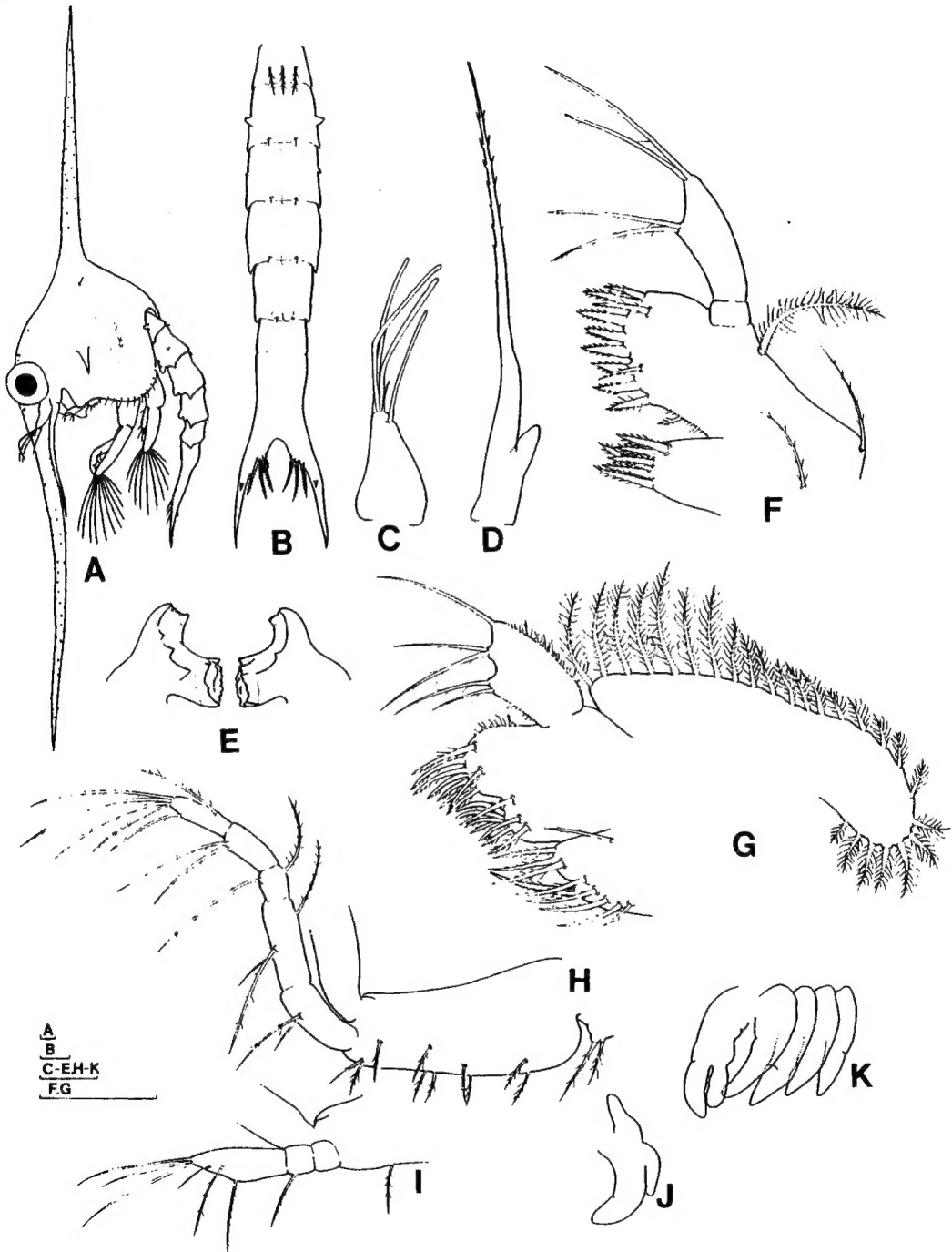


Fig. 4. Fourth zoea of *Scopimera longidactyla*. A, lateral view; B, dorsal view of abdomen; C, antennule; D, antenna; E, mandibles; F, maxillule; G, maxilla; H, maxilliped 1; I, maxilliped 2; J, maxilliped 3; K, pereopods. Scale bars = 0.1 mm.

proximal lobes of basal endite with 7-8 and 8-9 plumodenticulate setae respectively; scaphognathite with 23-26 plumose setae.

Maxilliped 1 (Fig. 4-H). Coxa with 2 plumodenticulate setae; plumose and plumodenticulate setae added on second and distal segments of endopod respectively, setation now 2,3,2,2,6; exopod with 10 plumose natatory setae.

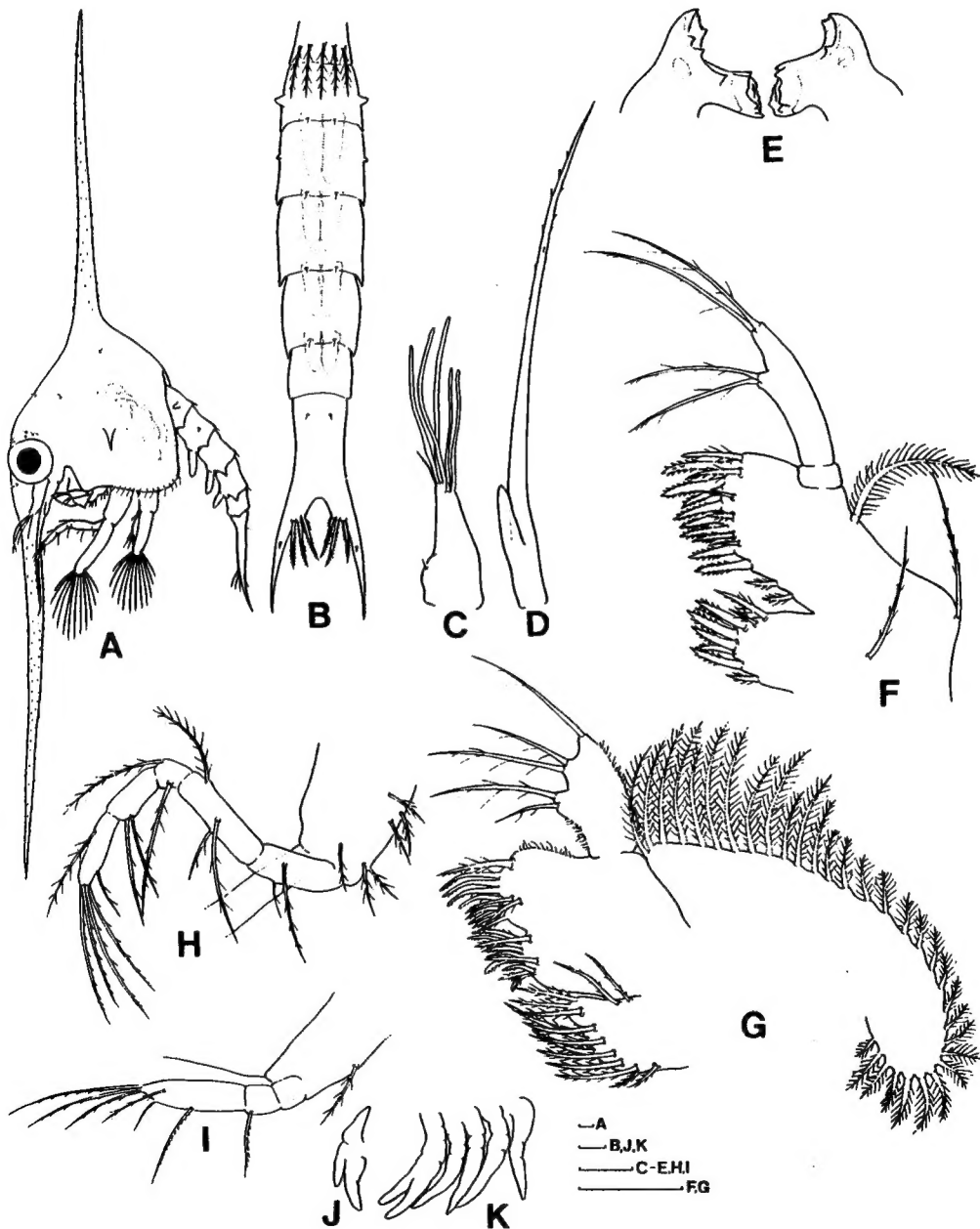


Fig. 5. Fifth zoea of *Scopimera longidactyla*. A, lateral view; B, dorsal view of abdomen; C, antennule; D, antenna; E, mandibles; F, maxillule; G, maxilla; H, maxilliped 1; I, maxilliped 2; J, maxilliped 3; K, pereopods. Scale bars = 0.1 mm.

Maxilliped 2 (Fig. 4-I). Exopod with 10 plumose natatory setae.

Maxilliped 3 (Fig. 4-J). Trilobed.

Pereiopods (Fig. 4-K). Future segmentation visible; chela bifurcated.

Fifth Zoea (Fig. 5)

Carapace (Fig. 5-A). Eight pairs of simple setae as illustrated; postero-ventral margin with 12-13 plumose setae.

Abdomen (Fig. 5-B). Pleopod buds much more elongated; paired dorsal simple setae on proximal region of telson.

Antennule (Fig. 5-C). Aesthetascs arranged in two tiers: 3 aesthetascs plus simple seta terminally and 2 aesthetascs subterminally; basal region swollen, with simple seta.

Antenna (Fig. 5-D). As in the fourth stage but endopod longer.

Mandibles (Fig. 5-E). Mandibular palps present as small buds.

Maxillule (Fig. 5-F). Coxal endite with 9 plumodenticulate setae; basal endite with 14 terminal and 2 lateral plumodenticulate setae.

Maxilla (Fig. 5-G). Coxal endite with 3 terminal, 9-10 subterminal and 1-2 lateral plumose setae; distal and proximal lobes of basal endite each with 10-11 plumodenticulate setae; scaphognathite with 33-38 densely plumose setae marginally.

Maxilliped 1 (Fig. 5-H). Exopod with 12 plumose natatory setae.

Maxilliped 2 (Fig. 5-I). Exopod with 12 plumose natatory setae.

Maxilliped 3 (Fig. 5-J). As in the fourth stage.

Pereiopods (Fig. 5-K). Longer and incompletely segmented.

Megalopa (Fig. 6,7)

Carapace (Fig. 6-A, B). Subquadrate in dorsal view; rostrum curved ventrally. Simple setae scattered on dorsal surface; about 12 stout plumodenticulate setae on each antero-lateral region; plumose setae fringed along lateral and posterior margins; several simple setae on eyestalk; spine posterior to eyestalk and 2 smaller tubercles on medio-lateral side; smooth undulations laterally as illustrated.

Abdomen (Fig. 6-A). Six somites and telson; somites 1-6 each with 8 (+ 4 plumose), 10, 10, 14, 16 and 4 dorsal simple setae.

Telson (Fig. 7-K4). Smooth, semicircular in shape; with 4 dorsal and 4 ventral simple setae and 2 posterior spines.

Antennule (Fig. 6-C). Peduncle three-segmented; basal segment with 8 plumose and 3-4 simple setae, second and third segments with simple seta respectively. Unsegmented lower ramus with 2 terminal plumose setae; incompletely two-segmented upper ramus with 3 aesthetascs plus plumose seta terminally and 2 aesthetascs plus simple seta subterminally.

Antenna (Fig. 6-D). Seven-segmented: segments each with 2, 0, 2, 0, 0, 2-3 and 2 simple setae.

Mandible (Fig. 6-E). Symmetrical; cutting margin smooth, not clearly divided into incisor and molar processes. Palp incompletely two-segmented; proximal segment naked, distal segment with 5-6 long plumose setae proximally and 21 modified hooked serrate and plumodenticulate setae distally.

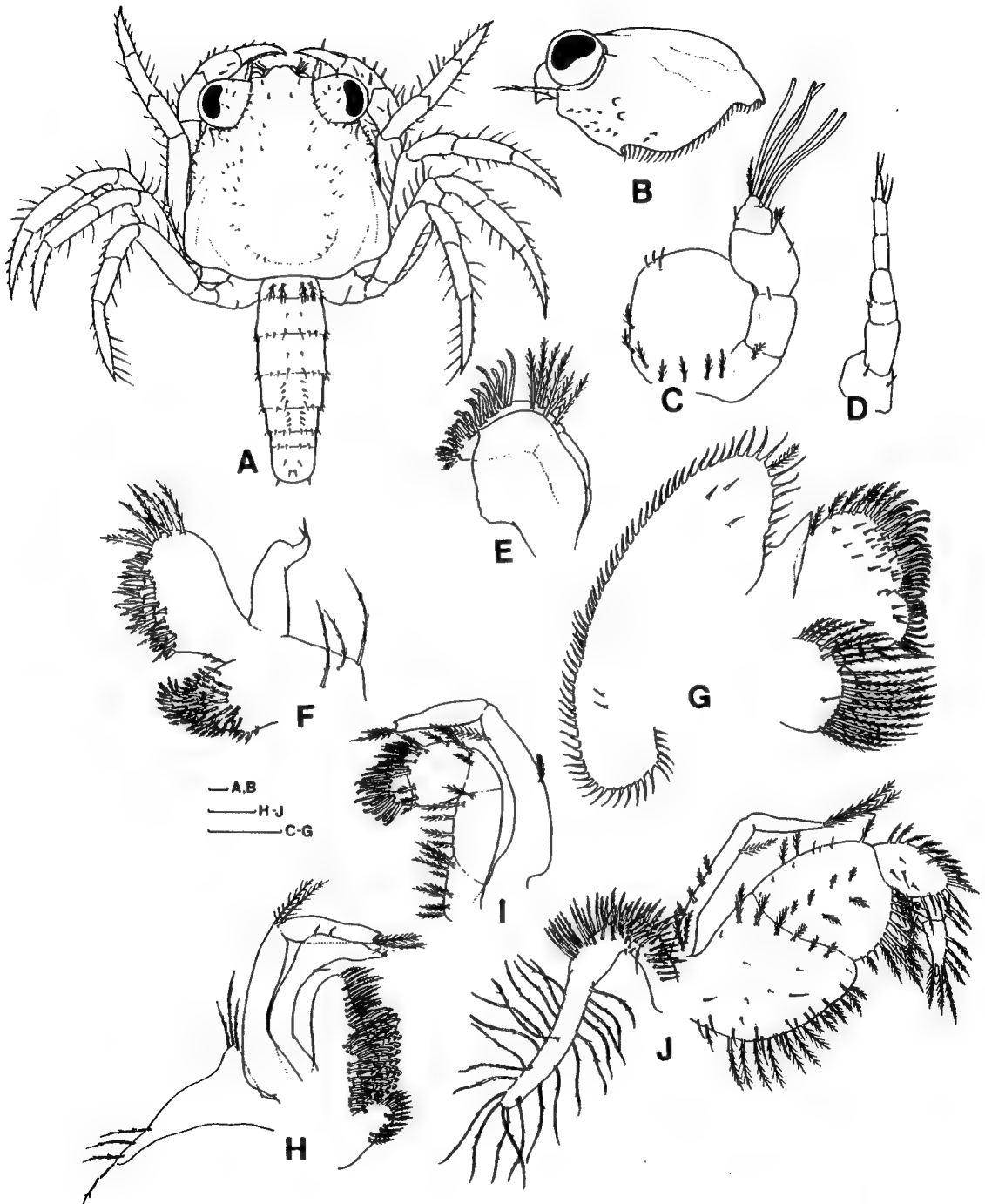


Fig. 6. Megalopa of *Scopimera longidactyla*. A, dorsal view; B, lateral view of carapace; C, antennule; D, antenna; E, mandible; F, maxillule; G, maxilla; H, maxilliped 1; I, maxilliped 2; J, maxilliped 3. Scale bars = 0.1 mm.

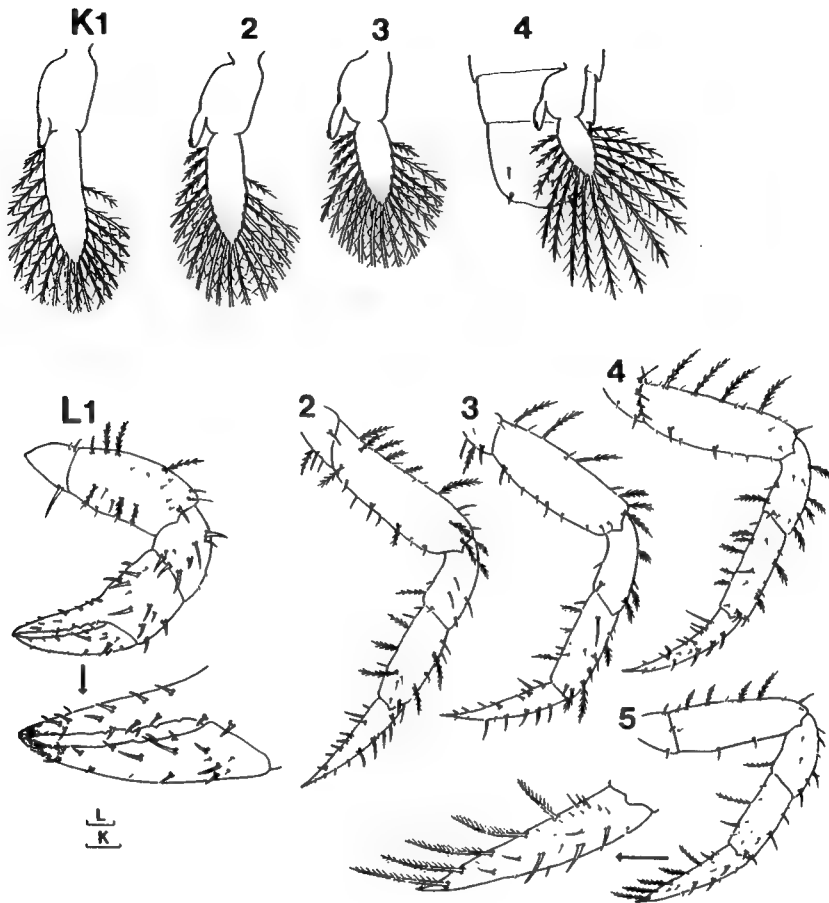


Fig. 7. Megalopa of *Scopimera longidactyla*. K1-4, pleopods 1-4; L1, chela; L2-5, pereopods 2-5. Scale bars = 0.1 mm.

Maxillule (Fig. 6-F). Coxal endite with 52-67 plumodenticulate setae, basal endite with 42-47 terminal and 2 lateral plumodenticulate setae; 3 long plumose setae on dorsal margin; incompletely segmented endopod with 2 terminal simple setae.

Maxilla (Fig. 6-G). Coxal endite with 19-20 long plumose and 7 shorter simple setae; distal and proximal lobes of basal endite each with 45-50, 19-23 plumodenticulate setae; endopod naked, triangular in shape; scaphognathite with 75-82 plumose setae on margin and 5-7 plumose setae on blade.

Maxilliped 1 (Fig. 6-H). Coxa with 10-12 plumodenticulate setae; basis with approximately 80 plumodenticulate and modified hooked serrate setae; endopod with 4-5 simple setae; exopod two-segmented, each segment with 2 plumose setae; epipod with 7-8 sparsely plumodenticulate setae marginally.

Maxilliped 2 (Fig. 6-I). Endopod five-segmented, plumodenticulate setal formula 8, 5, 2, 14, 15; exopod two-segmented: proximal segment with 2 plumose setae terminally, distal segment with 2 plumose and a small simple setae terminally.

Maxilliped 3 (Fig. 6-J). Endopod five-segmented, plumodenticulate setal formula 34, 21, 18, 3, 6; exopod with 6-7 plumose seta on proximal segment and 2 terminal plumose setae on distal segment; epipod with 50-65 plumodenticulate setae proximally and 20-23 longer plumodenticulate setae distally.

Pleopods (Fig. 7-K1-4). Well-developed on somites 2-5; exopods on somites 2-5 each with 18-20, 19-20, 17-18, 14-16 long plumose natatory setae; unsegmented endopod with 3 appendix internae.

Pereiopods (Fig. 7-L1-5). Cheliped with simple and plumose setae and stout spines as illustrated; fingers terminating in clusters of hairs, with a few teeth on each cutting margin. Pereiopods 2-4 similar in form, dactylus terminating in sharp spine. Pereiopod 5 with 5 long plumose setae on ventral margin of dactylus, instead of "brachyuran feelers".

Chromatophores. Dark brown chromatophores occur on carapace center, eyestalks, all segments of pereiopods 1-5, abdominal somites 1-5 and telson; smaller ones around carapace center. Orange red chromatophores are also present on eyestalks and carapace center.

DISCUSSION

Although there is no single morphological character separating the ocypodid larvae from other families, they are well characterized at the subfamily level by the combination of mouthparts setations suggested by Rice (1975, 1980). In this respect, the mouthparts setations of *Scopimera longidactyla* zoeae conform closely to those of the subfamily Scopimerinae established by Rice (1975) (i.e., 0 and 4 setae on maxillule endopod, 5 setae on maxilla endopod and 0-1-6 setae on second maxilliped endopod).

The relative ratio of rostral carapace spine length to carapace length ($= R/C$) can be used to distinguish the *Scopimera* zoeae from the other Scopimerinae ones. The ratio is $R/C > 1.5$ in the known first zoeae of the *Scopimera*, while $1.0 < R/C < 1.5$ and $R/C < 1.0$ in those of the *Ilyoplax* and *Dotilla* respectively. This ratio can be also used for separating the Scopimerinae zoeae from other two subfamilies: $R/C < 1.0$ in the Ocypodinae and Macrophthalminae but $R/C > 1.0$ in the Scopimerinae with an exception of the genus *Dotilla*. (These ratios are based on the available illustrations.)

The known *Scopimera* larvae are so similar in morphology that it is very difficult to distinguish them. The larvae of *S. longidactyla* (present study), in particular, exhibit extremely close morphological similarity with those of *S. globosa* described by Terada (1976). In the first and second zoeal stages, there is virtually no distinct difference in morphological features between the two species, except for an additional seta on antennule of *S. globosa* (Table 2). However, they can be discriminated by the setation on basal endite of maxilla and endopod of first maxilliped in the fourth zoeal stage and by the setation on basal endites of maxillule and maxilla in the fifth zoeal stage. Although they are unable to be identified by the setation on appendages in the third zoeal stage, measurements of total spine lengths (TSL) can be used in distinguishing them during the third to fifth zoeal stages.

The first zoeal stage of *S. crabricauda* and the complete zoeal stages of *S. inflata* described by Rice (1976) and Fielder and Greenwood (1985) respectively can be readily identified by observation of external morphology without dissection. As noted by Rice (1976), the zoea of *S. crabricauda* has much longer dorsal carapace spine ($>$ twice carapace length) when compared to those of the other *Scopimera* species ($<$ twice carapace length). The zoeae of *S. inflata* have two dorsal spines on telson fork while those of the other *Scopimera* species have one spine only. In addition, dorsal and rostral carapace spines of *S. crabricauda* and *S. inflata* are smooth and naked, as opposed to those of *S. longidactyla* and *S. globosa* having small denticles or teeth on entire surface.

The megalopal descriptions of the *Scopimera* are available for *S. longidactyla* (present study), *S. globosa*

Table 2. Comparison of zoeal size and appendage setation in four species of *Scopimera*.

	Antennule		Maxillule		Maxilla		Maxilliped 1				Maxillipe 2		Telson		
	CL	TSL	Coxal E.	Basal E.	Coxal E.	Basal E.	Scapho.	Basis	Endopod	Exopod	Basis	Endopod		Exopod	Dorsal Sp.
Zoeal 1	S.l.	0.43	1.70	2A,1S	4	5	5	4,5(9)	4+ tip	2,2,3,3,2,2,1,2,5	4	3	0,1,6	4	1
	S.g.	0.42	1.80	2A,2S	4	5	5	4,5(9)	4+ tip	2,2,3,3,2,2,1,2,5	4	3	0,1,6	4	1
	S.i.	0.52	2.22	3A,1S	4	5	6	4,5(9)	4+ tip	2,2,3,3,2,2,1,2,5	4	3	0,1,6	4	2
	S.c.	0.48	2.56	2A,1-2S	3	4	5	3,4(7)	4+ tip	2,2,3,3,2,2,1,2,5	4	3	0,1,6	4	1
Zoeal 2	S.l.	0.52	2.34	4A,1S	5	7	6	5,5(10)	8	2,2,3,3,2,2,1,2,5	6	3	0,1,6	6	1
	S.g.	0.51	2.28	4A,2S	5	7	6	5,5(10)	8	2,2,3,3,2,2,1,2,5	6	3	0,1,6	6	1
	S.i.	0.76	3.00	5-6A,1S	4-5	7	6	5,5-6(10-11)	8	2,2,3,3,2,2,1,2,5	6	3	0,1,6	6	2
Zoea 3	S.l.	0.72	3.53	3A,1S	5	7-8	7	6,6(12)	13	2,2,3,3,2,2,2,2,5	8	3	0,1,6	8	1
	S.g.	0.66	2.78	3A,1S	5	7	7	6,6(12)	13	2,2,3,3,2,2,2,2,5	8	3	0,1,6	8	1
	S.i.	1.05	4.71	3A,1S	6	8	7	6,7-8(13-14)	14-16	2,2,3,3,2,2,2,2,6	8	3	0,1,6	8	2
Zoeal 4	S.l.	0.97	4.86	4A,1S	6	10+1	9-10	7-8,8-9(15-17)	23-26	2,2,3,3,2,3,2,2,5	10	3	0,1,6	10	1
	S.g.	0.93	4.03	4A,1S	6	10+1	9	8,7(15)	23	2,2,3,3,2,3,2,2,6	9-10	3	0,1,6	10	1
	S.i.	1.41	6.48	4A,1S	8	12-13	11	7-9,8-11(15-20)	28-32	2,2,3,3,2,3,2,2,6	10	3	0,1,6	10	2
Zoeal 5	S.l.	1.26	6.22	5A,1S+(1)	9	14+2	13-15	10-11,10-11(20-22)	33-38	2,2,3,3,2,3,2,2,6	12	3	0,1,6	12	1
	S.g.	1.06	5.02	5A,1S	9	13+2	13-15	9,10(19)	37	2,2,3,3,2,3,2,2,6	11-12	3	0,1,6	12	1
	S.i.	1.86	8.03	5A,2S	13-22	21-22	24-29	15-19,14-16(29-35)	45-52	17-20 2,3,2,2,7	12	3	0,1,7	12	2

S.c., *S. crabricauda*; S.g., *S. globosa*; S.i., *S. inflata*; S.i., *S. longidactyla*. CL, carapace length (mm); TSL, total spine length (mm); A, aesthetascs; E, endite; S, simple seta; Scapho, scaphognathite; Sp, spine.

Table 3. Comparison of megalopal characters in three species of *Scopimera*.

	<i>S. longidactyla</i> (present study)	<i>S. globosa</i> (Terada, 1976)	<i>S. inflata</i> (Fielder & Greenwood, 1985)
CARAPACE:			
Length/Width	1.23/1.09 mm	1.12/0.96 mm	1.80/1.60 mm
Features	subquadrate; 1 spine, 2 tubercles posterior to eyestalk; many setae dorsally	rectangular; no spine; smooth and naked dorsally*	ovate; 1 obvious cardiac spine; smooth and naked dorsally
ANTENNULE:			
Upper ramus	5A + 1P + 1S	5A + 3S	6A + 2S
Lower ramus	2P	2S	2S
ANTENNA:			
Flagellum	2S;0;2S;0;0;2-3S;2S	1P;0;2S;0;0;2S;2S*	2S + 3P;0;2S;0;0;2S;2S
MANDIBLE:			
Palp	2-segmented 0;5-6P + 21MHS	2-segmented 4PD;23PD	1-segmented c.11S + 13P*
MAXILLULE:			
Endopod	1-segmented 2S	2-segmented 0;2S	3-segmented** 1PD;0;3S
MAXILLA:			
Endopod	0	0	1P + 2S
Scaphognathite	80-89P	c.65P	70P + 5S
MAXILLIPED I:			
Endopod	4-5S	5S	4-6S
Exopod	2P;2P	2P;2S	3P;c.7P
Epipod	7-8PD	7PD	4-6S
MAXILLIPED II:			
Endopod	5-segmented	4-segmented	5-segmented
Exopod	2P;1S + 2P	2;3	1PD;1S + 10P
MAXILLIPED III:			
Exopod	6-7P;2P	5;3	0;5P
Epipod(distal)	20-23PD	c.19	18-20PD
Telson	4 dorsal + 4 ventral + 2 posterior S	2 posterior spines	6 dorsal setules; 2 posterior extensions (each with 1 spine + 3 biplumose setae + 1 highly plumose seta)

* Data based on illustrations; ** 2-segmented in illustration. A, aesthetascs; MHS, modified hooked serrate seta; P, plumose seta; PD, plumodenticulate seta; S, simple seta

and *S. inflata*. Morphological differences among the megalopae are much more distinct than the zoeal stages (Table 3). The megalopa of *S. longidactyla* is distinguished from those of *S. globosa* and *S. inflata* by having a spine and two tubercles posterior to eyestalk, lateral undulations (which are absent in the latter two species) and the intermediate size among the three. Other minor features distinguishing the megalopae include the setations, segmentation and setal types on appendages (Table 3).

It is important to discriminate the larvae of *S. longidactyla* from those of *S. globosa* because they occur together in the Yellow Sea of Korea. Although the larvae of these species, whose adults are also similar, resemble very closely each other in most respects, discrimination between them may not be difficult if various minor features mentioned above are examined in detail.

ABSTRACT

The larval stages of *Scopimera longidactyla* reared in the laboratory are described and illustrated in detail. The larval development consists of five zoeal and a megalopal stages. At 25°C, the megalopa and the first crab instar were attained in 21 and 31 days after hatching, respectively.

The larvae of *Scopimera* can be distinguished from those of other genera in the Scopimerinae and other subfamilies in the Ocypodidae by the relative length of rostral carapace spines to carapace. The larvae of *S. longidactyla* are similar in morphology to those of *S. globosa* but distinguished by the differences in larval size, and appendage setation.

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